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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/521,793

01/21/2005

Elji Tani

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EXAMINER

LAZORCIK, JASON L

ART UNIT

PAPER NUMBER

1731

DATE MAILED: 09/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/521,793

Applicant(s)

TANI, ELJI

Examiner

Jason L. Lazorcik

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2005 and 02 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☒ Claim(s) 1-10 and 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>01/21/2005</u> . | 6) <input type="checkbox"/> Other: <u>IDS Filed: 04/19/2005</u> . |

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Claims 4-12 drawn to a process of manufacture in the reply filed on August 2, 2006 is acknowledged. The traversal is on the ground(s) that "the Examiner has not carried the burden of providing any reasons and/or examples to support any conclusion s that the claims of the restricted groups are patentably distinct, or providing any reasons and/or examples to support any conclusion that the claims of the groups lack unity of invention". This has been found persuasive because both Group I, drawn to a silicon carbide material, and Group II, drawn to the manufacture of said material, recite a single inventive concept embodied in the method of manufacturing the silicon carbide based material.

As such, the claims previously withdrawn from consideration under 37 CFR 1.142 have been rejoined, and **the restriction requirement as set forth in the Office action mailed on June 9, 2006 is hereby withdrawn**. In view of the withdrawal of the restriction requirement as to the rejoined inventions, applicant(s) are advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once the restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

The disclosure is objected to because of the following informalities: The disclosure is replete with grammatical and spelling errors. The following list may be taken as a representative sampling of these grammatical errors:

- Page 3 line 9, "a" should be replaced with "the".
- Page 4, line 1 insert "the" between "that" and "reaction"

The preceding list is not exhaustive, and applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "bone structure" in claims 1,2, 3, 4, 5, 6, 7, 8, 9, 11, and 12 is not defined by the claim, and the specification does not provide a standard for ascertaining the requisite degree. The term "bone structure" typically refers to the morphology of a tissue produced by a living animal, and therefore does not appear to apply in the context of the immediate invention. Since the specification does not provide a clear definition for this term as it relates to the structure of the "carbon powder-made porous

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structural body", one of ordinary skill in the art would not necessarily be apprised of the scope of the invention, and therefore the specified claims are rendered indefinite.

Claim 10/5 recites the limitation "the powdered silicon" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 12/5 recites the limitation "the powdered silicon" in line 10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 1,2, 4, 5, 7-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luhleich (US 4,293,512).

Luhleich teaches a method of providing a protective carbide layer on a graphitic molded article and that such a layer is produced (abstract) either by:

1. Dipping the molded graphite article into melted silicon,
2. Dipping the molded graphite article into a succession of suspensions or “a slurry” of carbon, silicon, and a binder resin, where each successive layer contains a greater silicon content than the prior layer, **or**
3. Applying successive layers of a paste of carbon, silicon, and a binder resin, again with each successive layer contains a greater silicon content than the prior layer.

The immediate reference teaches (Column1, Lines 18-24) that the molded graphite article consists of carbonaceous particles in the form of graphite, artificial graphite including carbon black (Column 1, Line34), or the like coated with a binder. This molded graphite article is understood to be functionally equivalent to the claimed “a carbon powder-made porous structural body having a bone structure”. It is here noted that while the immediate reference teaches that “there is considerable variety among the known methods of making molded articles of graphite” (Column 1, Lines 25-27), it fails to explicitly indicate that the molded graphite article is formed by extrusion of powdered carbon into a honeycomb shape.

Luhleich further teaches:

1. The slurry or “the resin” comprises suspended silicon powder in a phenolformaldehyde resin which is commonly understood to be “a phenol resin” (see http://en.wikipedia.org/wiki/Phenolic_resin) and containing “an additive” or graphitic powder added to the slurry (Column 2, Lines 47-59).

2. After dipping the molded graphitic body into the slurry or equivalently “applying a slurry...by impregnation” as claimed, the temperature of body is raised to between 1550°C and 1800°C to form silicon carbide. The temperature ramp, conducted under a protective atmosphere of argon or “an inert gas atmosphere”, is understood to read upon both the process carbonizing the slurry at 900 to 1,300°C as well as the reaction sintering step at a temperature of 1,300°C or more.

Luhleich teaches that due to the mismatch in thermal expansion coefficients, a layer of SiC formed directly upon carbonaceous material (e.g. a graphite molded body) displays poor adhesive properties and “often breaks off upon cooling after being heated up and the vessel accordingly has only a short useful life for its intended purpose” (Column 2, lines 18-34). Further, the sequential layering approach described above enhances the adhesion of the coating and provides an article with “a long useful life even under high stress”.

Regarding Claims 4, 5, 7-9, and 11, The Luhleich reference teaches that a SiC layer is formed on a graphite body either by the sequential layering technique *or* by an immersion in molten silicon bath. It fails to explicitly set forth a scenario wherein after the sequential layering and sintering of the slurry on the graphite body, the layered and sintered body is immersed in a molten silicon bath. Luhleich further teaches that in the absence of the sequential layering technique the adhesion of the SiC layer to the graphite body is poor, and said layering enhances this adhesion and thus the lifetime of the coated part. It would have been obvious to one of ordinary skill in the art at the time

of the invention when forming a SiC layer by immersion of a graphite body in molten silicon as taught by Luhleich to **first** undertake the sequential layering and sintering process according the above layering technique. This would have been an obvious modification to one of ordinary skill seeking to enhance the adhesion between the SiC layer formed by the immersion process and the molded graphite body as taught by the Luhleich process.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as obvious over prior art. In the instant case, Claim 1 is drawn to A silicon carbide-based heat resistance porous structural material made the process set forth for the method for manufacturing said material as outlined in Claim 4. Further, Claim 2 is drawn to a silicon carbide-based heat resistance porous structural material made the process set forth for the method for manufacturing said material as outlined in Claim 5. As such, Claims 1 and 2 amount to product-by-process claims for the processes set forth in Claims 4 and 5, respectively.

In the event any differences can be shown for the product-by-process claims 1 and 2, as opposed to the product taught by prior art, such differences would have been obvious to one of ordinary skill in the art as routine modification of the product in the absence of a showing of unexpected results, see *In re Thorpe*, 227 USPQ 964 (CAFC 1985). As the afore mentioned claim is a product by process claim, it is deemed that "[A]ny difference imparted by the product by process claims would have been obvious to one having ordinary skill in the art at the time the invention was made because where the examiner has found a substantially similar product as in the applied prior art the burden of proof is shifted to the applicants to establish that their product is patentably

distinct, ...”In re Brown, 173 USPQ 685, and In re Fessmann, 180 USPQ 324. Further, “[P]rocess limitations are significant only to the extent that they distinguish the claimed product over the prior art product.” In re Luck, 177 USPQ 523 (1973).

Claim 3/1 and 3/2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luhleich (US 4,293,512) as applied to claims 1 and 2, respectively, and in further view of Bookbinder (US 5,389,325).

The Luhleich teaches (Column1, Lines 18-24) that the molded graphite article consists of carbonaceous particles in the form of graphite, artificial graphite including carbon black (Column 1, Line34), or the like coated with a binder. While the immediate reference teaches that “there is considerable variety among the known methods of making molded articles of graphite” (Column 1, Lines 25-27), it fails to explicitly indicate that the molded graphite article is formed by extrusion of powdered carbon into a honeycomb shape. Bookbinder teaches the preparation of a slurry of activated carbon and phenolic resin (abstract) and the subsequent formation of the slurry by extrusion (Column 6, lines 65-67) into a honeycomb structure (Column 6, lines 43-45) in order to manufacture a component for engine exhaust purification.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the extruded, honeycomb-shaped graphite engine exhaust part taught by Bookbinder by forming a protective silicon carbide outer skin on said part according to the Luhleich process. This would have been an obvious modification to anyone seeking to increase the resistance of the part to the effect of corrosive

environments at elevated temperatures (Column 1, Lines 14-17) while insuring good interlayer adhesion between the graphite and SiC layers.

Claim 6/4 and 6/5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luhleich (US 4,293,512) as applied to claims 4 and 5, respectively, and in further view of Bookbinder (US 5,389,325). As indicated in the rejections of claims 3/1 and 3/2 above, it is well known to form honeycomb shaped parts by the extrusion of a graphite powder according to the teachings of Bookbinder. It is also appreciated widely appreciated in the art that silicon carbide coatings enhance the thermal and corrosion resistance of graphite article. Finally, the sequential layering and sintering of a silicon and carbon slurry as outlined in the rejection of Claim 3 above provides enhanced adhesion and thus an extended lifetime for the SiC coated graphite article. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the extruded, honeycomb-shaped graphite engine exhaust part taught by Bookbinder by forming a protective silicon carbide outer skin on said part according to the Luhleich process.

Claims 10/4, 10/5, 12/4 and 12/5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luhleich (US 4,293,512) as respectively applied in the rejections of Claim 4 and Claim 5 above. Luhleich fails to teach that a mixture of powdered silicon and one of the indicated elements including aluminum should be utilized in the slurry. Johnson teaches that "aluminum forms a eutectic with aluminum" and that by combining aluminum with silicon, the hard to react silicon is activated and reacts more readily (e.g. at a lower temperature) during the formation of silicon carbide (Column 4,

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Lines 44-59). It would therefore have been obvious to one of ordinary skill in the art at the time of the invention add an amount of aluminum to the silicon powder in the slurry as taught in the Luhleich disclosure. Since Johnson teaches that alloys of aluminum and silicon melt and form carbide ceramics at lower temperatures than pure silicon, this modification would have been obvious to anyone seeking to save equipment and operating costs by lowering the temperature of the reactive sintering step in the Luhleich process.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Lazorcik whose telephone number is (571) 272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JLL


ERIC HUG
PRIMARY EXAMINER